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EOSDIS Core System Project

Subscription Server Database Design and Schema Specifications for the ECS Project

Draft

January 1998

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Raytheon Systems Company
Upper Marlboro, Maryland

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Draft

January 1998

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CDRL Item #050

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Preface

This document describes the data design and database specification for the Subscription Server subsystem. It is one of ten documents comprising the detailed database design specifications for each of the ECS subsystems.

The subsystem database design specifications for the as delivered system include:

311-CD-101 Data Distribution (DDIST) Subsystem Database Design and Database Schema Specifications for the ECS Project

311-CD-102 Data Management (DM) Subsystem Database Design and Database Schema Specifications for the ECS Project

311-CD-103 Ingest Subsystem Database Design and Database Schema Specifications for the ECS Project

311-CD-104 Interoperability Subsystem (IOS) Database Design and Database Schema Specifications for the ECS Project

311-CD-105 Management Support Subsystem (MSS) Database Design and Database Schema Specifications for the ECS Project

311-CD-106 Planning and Data Processing Subsystem (PDPS) Database Design and Database Schema Specifications for the ECS Project

311-CD-107 Science Data Server (SDSRV) Subsystem Database Design and Database Schema Specifications for the ECS Project

311-CD-108 Storage Management (STMGMT) Subsystem Database Design and Database Schema Specifications for the ECS Project

311-CD-109 Subscription Server (SUBSRV) Subsystem Database Design and Database Schema Specifications for the ECS Project

This submittal meets the milestone specified in the Contract Data Requirements List (CDRL) of NASA Contract NAS5-60000. It is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once approved, contractor approved changes will be handled in accordance with Class I and lass II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by Document Change Notice (DCN) or by complete revision.

Entity Relationship Diagrams (ERDs) presented in this document have been exported directly from tools and some cases contain too much detail to be easily readable within hard copy page constraints. The reader is encouraged to view these drawings on-line using the Portable Document Format (PDF) electronic copy available via the ECS Data Handling System (ECS) on the world-wide web at <http://edhs1.gsfc.nasa.gov>.

Any questions should be addressed to:

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Abstract

This document outlines “as-built” database design and database schema of the Subscription Server database including the physical layout of the database and initial installation parameters.

Keywords: data, database, design, configuration, database installation, scripts, security, data model, data dictionary, replication, performance tuning, SQL server, database security, replication, database scripts

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Change Information Page

List of Effective Pages			
Page Number		Issue	
Title		Draft	
iii through xii		Draft	
1-1 through 1-2		Draft	
2-1 through 2-2		Draft	
3-1 through 3-2		Draft	
4-1 through 4-10		Draft	
5-1 through 5-2		Draft	
6-1 through 6-2		Draft	
7-1 through 7-2		Draft	
8-1 through 8-2		Draft	
AB-1 through AB-8		Draft	
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311-CD-109-001	Draft	January 1998	97-1755

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Contents

Preface

Abstract

1. Introduction

1.1 Identification	1-1
1.2 Scope	1-1
1.3 Purpose.....	1-1
1.4 Audience	1-1

2. Related Documents

2.1 Applicable Documents.....	2-1
2.2 Information Documents	2-1

3. Database Configurations

3.1 Server Configurations	3-1
3.2 Storage Device Layouts	3-1

4. Data Design

4.1 Database Overview	4-1
4.1.1 Physical Data Model Entity Relationship Diagram	4-1
4.1.2 Tables	4-2
4.1.3 Columns	4-3
4.1.4 Column Domains	4-4
4.1.5 Rules.....	4-5
4.1.6 Defaults	4-5

4.1.7 Views	4-5
4.1.8 Integrity Constraints.....	4-5
4.1.9 Triggers	4-5
4.1.10 Stored Procedures	4-5
4.2 File Usage	4-9
4.2.1 Files Definitions.....	4-9
4.2.2 Attributes.....	4-9
4.2.3 Attribute Domains.....	4-9

5. Performance and Tuning Factors

5.1 Indexes	5-1
5.2 Segments.....	5-1
5.3 Named Caches.....	5-1

6. Database Security

6.1 Initial Users	6-1
6.2 Groups.....	6-1
6.3 Roles	6-1

7. Replication

7.1 Replication Overview	7-1
7.2 Replication Definitions	7-1
7.3 Replication Subscriptions	7-1
7.4 Replication Database Configuration	7-1
7.5 Replication Server Configuration	7-1

8. Scripts

8.1 Installation Scripts.....8-1

8.2 De-Installation Scripts.....8-1

8.3 Backup/Recovery Scripts.....8-1

8.4 Miscellaneous Scripts8-1

List of Figures

4-1. ERD Key.....4-1

4-2. SUBSRV ERD.....4-2

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1. Introduction

1.1 Identification

This Subscription Server (SUBSRV) Database Design and Database Schema Specification document, Contract Data Requirement List (CDRL) Item Number 050, whose requirements are specified in Data Item description DID_311/DV1, is a required deliverable under the Earth Observing System (EOS) Data and Information System (EOSDIS) Core System (ECS), Contract NAS5-60000.

1.2 Scope

The SUBSRV Database Design and Database Schema Specification document describes the data design and database specifications to support the data requirements of Release 2 Drop 3 SUBSRV software.

1.3 Purpose

The purpose of the SUBSRV Database Design and Database Schema Specification document is to support the maintenance of SUBSRV data and databases throughout the life cycle of ECS. This document communicates the database implementation in sufficient detail to support ongoing configuration management.

1.4 Audience

This document is intended to be used by ECS maintenance and operations staff. The document is organized as follows:

Section 1 provides information regarding the identification, purpose, scope and audience of this document.

Section 2 provides a listing of the related documents, which were used as a source of information for this document.

Section 3 provides a mapping data bases to hardware components.

Section 4 contains the SUBSRV physical data model which is the database tables, triggers, stored procedures, and flat files.

Section 5. provides a description of database performance and tuning features such as indexes, caches, and data segments.

Section 6 provides a description of the security infrastructure used and list of the users, groups, and permissions available upon initial installation.

Section 7 contains replication design and implementation details.

Section 8 provides a description of database and database related scripts used for installation, de-installation, backup/recovery, and other miscellaneous functions.

2. Related Documents

2.1 Applicable Documents

The following documents, including Internet links, are referenced in the SUBSRV Database Design and Database Schema Specification, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume. Internet links cannot be guaranteed for accuracy or currency.

920-TDG-009	GSFC Release B0 DAAC Database Information
920-TDN- 009	NSIDC Release B0 DAAC Database Information
920-TDE-009	EDC Release B0 DAAC Database Information
920-TDL-009	LARC Release B0 DAAC Database Information
920-TDS-009	SMC Release B0 DAAC Database Information
920-TDM-009	Mini-DAAC Release B0 Database Information
920-TDG-001	GSFC Version 2.0 Hardware Diagram
920-TDN-001	NSIDC Version 2.0 Hardware Diagram
920-TDE-001	EDCC Version 2.0 Hardware Diagram
920-TDL-001	LARC Version 2.0 Hardware Diagram
920-TDS-001	SMC Version 2.0 Hardware Diagram
920-TDM-001	Mini-DAAC Version 2.0 Hardware Diagram
920-TDG-002	GSFC Version 2.0 Hardware Software Mapping
920-TDN-002	NSIDC Version 2.0 Hardware Software Mapping
920-TDE-002	EDC Version 2.0 Hardware Software Mapping
920-TDL-002	LARC Version 2.0 Hardware Software Mapping
920-TDS-002	SMC Version 2.0 Hardware Software Mapping
920-TDM-002	Mini-DAAC Version 2.0 Hardware Software Mapping

2.2 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document. These documents are not binding on this document.

To Be Supplied (TBS)

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3. Database Configurations

3.1 Server Configurations

The database configuration of the SUBSRV server varies from DAAC to DAAC based on individualized DAAC requirements and hardware availability. These DAAC-specific database configurations are detailed on the following documents:

920-TDG-009 GSFC Release B0 DAAC Database Information

920-TDN- 009 NSIDC Release B0 DAAC Database Information

920-TDE-009 EDC Release B0 DAAC Database Information

920-TDL-009 LARC Release B0 DAAC Database Information

920-TDS-009 SMC Release B0 DAAC Database Information

920-TDM-009 Mini-DAAC Release B0 Database Information

These documents are maintained as part of the ECS baseline and available on the world-wide web at the URL <http://pete.hitc.com/baseline/>.

3.2 Storage Device Layouts

Storage Device layouts, disk partitions, vary from DAAC to DAAC based on the amount of data storage expected to be needed to accommodate a particular DAAC's storage requirements. Disk partitions for the SUBSRV server at each DAAC is detailed in the following documents:

TBS

These documents are maintained as part of the ECS baseline and available on the world-wide web at the URL <http://pete.hitc.com/baseline/>.

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4. Data Design

4.1 Database Overview

The SUBSRV database implements the large majority of the persistent data requirements for the SUBSRV subsystem. The database is designed in such a manner as to satisfy business policy while maintaining data integrity and consistency. Database tables are implemented using the Sybase Relational Database Management system (DBMS) version 11.0.1. All components of the SUBSRV database are described in the section which follow in sufficient detail to support maintenance needs.

4.1.1 Physical Data Model Entity Relationship Diagram

The Entity Relationship Diagram(ERD) presents a schematic depiction of the SUBSRV physical data model. The ERDs presented here for the SUBSRV database were produced using the S-Designor Data Architect Computer Aided Software Engineering (CASE) tool. ERDs represent the relationship between entities or database tables. The key for the symbols used in the ERDs follows.

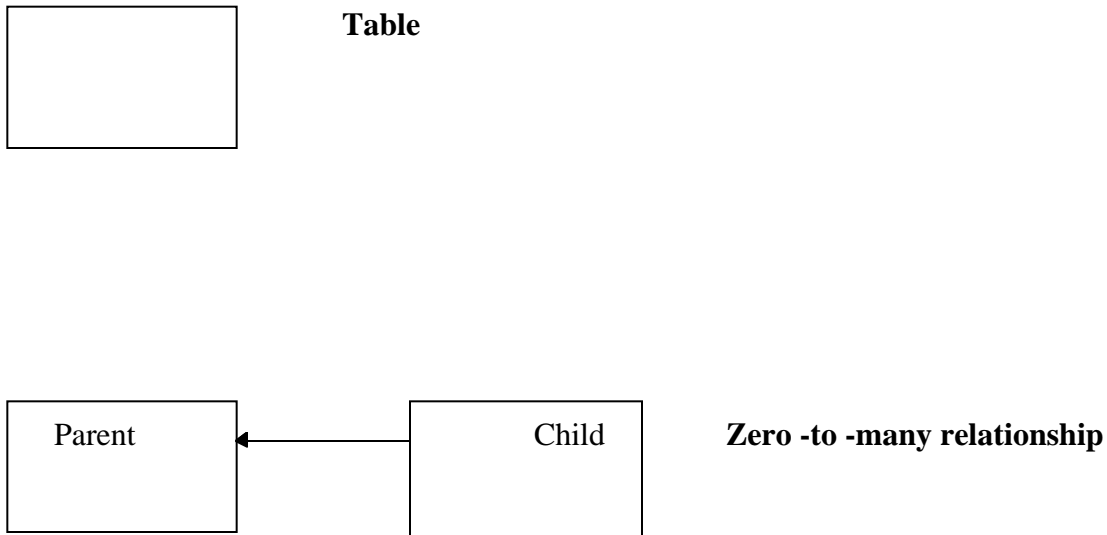


Figure 4-1. ERD Key

The ERDs for the SUBSRV database are shown in Figures 4-1 and 4-2.

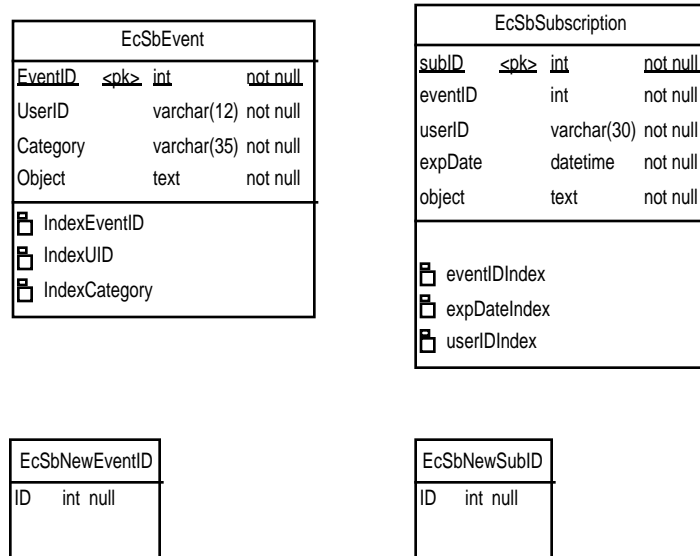


Figure 4-2. SUBSRV ERD

4.1.2 Tables

A listing of each the tables in the SUBSRV database is given here. A brief definition of each of these tables follows.

Table Name
EcSbEvent
EcSbNewEventID
EcSbNewSubID
EcSbSubscription

Table: EcSbEvent

Description

Contains the list of events that a user, or another subsystem can subscribe to.

Table Layout

Column	Type	PK	Mandatory
Category	varchar(35)	No	Yes
EventID	int	Yes	Yes
Object	text	No	Yes
UserID	varchar(12)	No	Yes

Table: EcSbNewEventID**Description**

This table is used to the next available ID for the EcSbEvent table.

Table Layout

Column	Type	PK	Mandatory
ID	int	No	No

Table: EcSbNewSubD**Description**

This table is used to the next available ID for the EcSbSubscription table.

Table Layout

Column	Type	PK	Mandatory
ID	int	No	No

Table: EcSbSubscription**Description**

This table lists all the user and subsystem subscriptions. Each event can have many subscriptions. Each user can have many subscriptions. The same user can subscribe to the same event with different constraints. It is also possible that a user could subscribe to the same event with the same constraints.

Table Layout

Column	Type	PK	Mandatory
eventID	int	No	Yes
expDate	datetime	No	Yes
object	text	No	Yes
subID	int	Yes	Yes
userID	varchar(30)	No	Yes

4.1.3 Columns

Brief definitions of each of the columns present in the database tables defined above are contained herein.

Column: Category**Description**

Qualifier describing the type or category of the event. Currently not used.

Column: EventID

Description

Unique identifier of the event..

Column: expDate

Description

Date and time that the subscriptions expires. Default is today. Must be >= today.

Column: ID

Description

The identification number available for the next event generated.

Column: ID

Description

The identification number available for the next subscription generated.

Column: object

Description

Event information including qualifiable metadata.

Column: subID

Description

Unique identifier of the subscription.

Column: UserID

Description

User registering the event.

4.1.4 Column Domains

Domains specify the ranges of values allowed for a given table column. Sybase supports the definition of specific domains to further limit the format of data for a given column. Sybase domains are, in effect, user-defined data types. There are no domains defined in the SUBSRV database.

4.1.5 Rules

Sybase supports the definitions of rules. Rules provide a means for enforcing domain constraints on a given column. There are no rules defined in Sybase for the SUBSRV database.

4.1.6 Defaults

Defaults are used to supply a value for a column when one is not defined at insert time. There are no defaults defined in Sybase in the SUBSRV database.

4.1.7 Views

Sybase allows the definition of views as a means of limiting an application or users access to data in a table or tables. Views create a logical table from columns found in one or more tables. There are no views defined in the SUBSRV database.

4.1.8 Integrity Constraints

Sybase version 11.0.1 allows the enforcement of referential integrity via the use of declarative integrity constraints. Integrity constraints allow the SQL server to enforce primary and foreign key integrity checks without automatically without requiring programming. Sybase 11 is only ANSI-92 compliant, however, therefore its constraints support “restrict-only” operations. This means that a row can not be deleted or updated if their are rows in other tables having a foreign key dependency on that row. Cascade delete and update operations can not be performed if a declarative constraint has been used. There are no declarative integrity constraints defined in the SUBSRV database.

4.1.9 Triggers

Sybase supports the enforcement of business policy via the use of triggers. A trigger is best defined as set of activities or checks that should be performed automatically when ever a row is inserted, updated, or deleted from a given table. Sybase version 11.0.1 allows the definition of insert, update, and delete trigger per table. No triggers are currently defined in the SUBSRV database.

4.1.10 Stored Procedures

Sybase also includes support for business policy via the use of stored procedures. Stored procedures are typically used to capture a set of activities or checks that will be performed on the database repeatedly to enforce business policy and maintain data integrity. Stored procedures are parsed and compiled SQL code that reside in the database and may be called by name by an application, trigger or another stored procedure A listing of each the stored procedures in the SUBSRV database is given here. A brief definition of each of these stored procedures follows.

Procedure List

Name	Description
ProcGetAllEvents	Retrieves all registered events.
ProcGetAllSubs	Retrieves all existing subscriptions.
ProcGetCatEvents	Retrieves all events for a given category.
ProcGetEvent	Retrieves a specific event.
ProcGetEventID	Returns the next available event ID.
ProcGetEventIDSubs	Selects subscriptions made against a specific event.
ProcGetExpSubs	Retrieves events scheduled to expire on a specific date.
ProcGetSub	Retrieves a specific subscription.
ProcGetSubID	Returns the next available subscription ID.
ProcGetUIDEvents	Retrieves events for a specific user.
ProcGetUserIDSubs	Retrieves subscriptions for a specific user.
ProcRemoveEvent	Deletes a specific event.
ProcRemoveSub	Deletes a specific subscription.

Procedure: ProcGetAllEvents

Code

```
/* Copyright (c) 1996, Hughes Aircraft Company, its vendors, and */
/* suppliers. ALL RIGHTS RESERVED. */

/*=====
==*/
/* File name : EcSbEventStoredProcs.sql */
/* */
/* Description : This file contains the needed stored procedures */
/* for the Events table */
/*=====
==*/

create proc ProcGetAllEvents
as
select Object from EcSbEvent
return
go
```

Procedure: ProcGetAllSubs

Code

```
create proc ProcGetAllSubs
as
select object from EcSbSubscription
return
go
```

Procedure: ProcGetCatEvents

Code

```
create proc ProcGetCatEvents (@Category varchar(35))
as
    select Object from EcSbEvent
    where Category = @Category
return
go
```

Procedure: ProcGetEvent

Code

```
create proc ProcGetEvent (@EventID int)
as
    select Object from EcSbEvent
    where EventID = @EventID
return
go
```

Procedure: ProcGetEventID

Code

```
create proc ProcGetEventID
as
    begin transaction pubs2
    update EcSbNewEventID set ID = ID + 1
    select ID from EcSbNewEventID
commit pubs2
return
go
```

Procedure: ProcGetEventIDSubs

Code

```
create proc ProcGetEventIDSubs(@eventID int)
as
select object from EcSbSubscription
    where eventID = (@eventID)
return
go
```

Procedure: ProcGetExpSubs

Code

```
create proc ProcGetExpSubs (@expDate datetime)
as
```

```
select object from EcSbSubscription
  where expDate = (@expDate)
return
go
```

Procedure: ProcGetSub

Code

```
create proc ProcGetSub(@subID int)
as
select object from EcSbSubscription
  where subID = (@subID)
return
go
```

Procedure: ProcGetSubID

Code

```
create proc ProcGetSubID
as
    begin transaction pubs2
    update EcSbNewSubID set ID = ID + 1
    select ID from EcSbNewSubID
commit pubs2
return
go
```

Procedure: ProcGetUIDEvents

Code

```
create proc ProcGetUIDEvents (@UserID varchar(12))
as
  select Object from EcSbEvent
  where UserID = @UserID
return
go
```

Procedure: ProcGetUserIDSbs

Code

```
create proc ProcGetUserIDSbs(@userID varchar(30))
as
select object from EcSbSubscription
  where userID = (@userID)
return
go
```

Procedure: ProcRemoveEvent

Code

```
create proc ProcRemoveEvent (@EventID int)
as
    delete EcSbEvent
    where EventID = (@EventID)
return
go
```

Procedure: ProcRemoveSub

Code

```
create proc ProcRemoveSub (@subID int)
as
delete EcSbSubscription
    where subID= (@subID)
return
go
```

4.2 File Usage

There are cases when the implementation of a persistent data requirement is better suited to a flat file than to a database table. A typical example of such data is system configuration information. System configuration information is fairly static and usually has no explicit relationship to other data in the enterprise. Another common use of files in ECS is as an interface mechanism between ECS and the external world. FIILSUB file usage is detailed in this section via file definitions, attribute definitions, and attribute domain definitions.

4.2.1 Files Definitions

A listing of each the files in the SUBSRV database is given here. A brief definition of each of these files follows.

TBS

4.2.2 Attributes

Brief definitions of each of the attributes present in the files defined above are contained herein.

TBS

4.2.3 Attribute Domains

Domains represent the ranges of valid values allowed for a given file attribute. Attributes domains for each of the attributes defined above are given here.

TBS

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5. Performance and Tuning Factors

5.1 Indexes

An index provides a means of locating a row in a table based on the value of specific a columns, without having to scan each row in the table. If used appropriately, indexes can significantly increase data retrieval. Sybase allows the definition of two types of indexes, clustered and non-clustered. In a clustered index, the rows in a tables are physically stored in the sort order determined by the index. Clustered indexes are particularly useful, when the data is frequently retrieved in order. Non-clustered indexes differ from their clustered counterpart, in that data is not physically stored in sort order. Only one clustered index may be defined per table. All of the indexes defined against tables in the SUBSRV database are described herein.

TBS

5.2 Segments

Sybase supports the definition of segments. A segment is a named pointer to a storage device or devices. Segments are used to manually place database objects onto particular storage devices. All segments explicitly defined in the SUBSRV database are described herein.

TBS

5.3 Named Caches

A cache is a block of memory that is used by Sybase to house data pages that are currently being accessed. A named cache is a named block of memory that the SQL server can use to house frequently accessed tables. Assigning a table to cache causes it to be loaded into memory. This greatly increases performance by eliminating the time expense normally associated with disk i/o. Named caches used in the SUBSRV databases are described herein.

TBS

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6. Database Security

6.1 Initial Users

Upon initial installation the following users will have access to SUBSRV database. The level of access is limited to that associated with their assigned group and/or role. A complete definition of each of these groups and roles is given below.

TBS

6.2 Groups

Groups are a means of logically associating users with similar data access needs. Once a group has been defined, object and command permissions can be granted to that group. A user who is member of a group inherits all of the permissions granted to that group. Several groups have been defined in the SUBSRV database upon initial installation. A definition of each of these groups is contained herein.

TBS

6.3 Roles

Roles were introduced in Sybase 10 to allow a structured means for granting users the permissions needed to perform standard database administration activities and also provide a means for easily identifying such users. There are six pre-defined roles that may be assigned to a user. A definition of each of these roles follows as well as a description of the types of activities that may be performed by each role.

System Administrator (sa_role) - This role is used to grant a specific user the permissions needed to perform standard system administrator duties including:

- installing SQL server and specific SQL server modules
- managing the allocation of physical storage
- tuning configuration parameters
- creating databases

Site Security Officer (sso_role) - This role is used to grant a specific user the permissions needed to maintain SQL server security including:

- adding server logins
- administering passwords
- managing the audit system

- granting users all roles except sa_role

Operator (oper_role) - This role is used to grant a specific user the permissions needed to manage backup and recovery of the database including;

- dumping transactions and databases
- loading transactions and databases

Navigator (navigator_role) - This role is used to grant a specific user the permissions needed to manage the navigation server.

Replication (replication_role) - - This role is used to grant a specific user the permissions needed to manage the replication server.

Sybase Technical Support (sybase_ts_role) - This role is used to grant a specific user the permissions needed to perform database consistency checker (dbcc), a sybase supplied utility, commands that are considered outside of the realm of normal system administrator activities.

7. Replication

7.1 Replication Overview

Replication as the name implies is a set of Sybase products that allow replication of data from one database to another. The SUBSRV database employs replication to support its warm stand-by requirements. In order for replication to be accomplished the data source must define the tables and columns that may be replicated to a data recipient. These definitions are referred to as replication definitions. In the same manner a data recipient must specify the replication definitions in which he is interested. These specifications are referred to as replication subscriptions. In addition the replication database and server must be configured to support the potentially large volumes of data that will be transferred between the source and recipient databases. Each of these important parameters is outlined in detail below.

7.2 Replication Definitions

Replication definitions that have been defined against SUBSRV tables and columns are detailed herein.

TBS

7.3 Replication Subscriptions

Replication subscriptions that have been defined against SUBSRV tables and columns are detailed herein.

TBS

7.4 Replication Database Configuration

Replication Database Configuration specifications applicable to SUBSRV replication are contained herein.

TBS

7.5 Replication Server Configuration

Replication Server Configuration specifications applicable to SUBSRV replication are contained herein.

TBS

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8. Scripts

8.1 Installation Scripts

Any scripts used to support installation of the SUBSRV database are described herein. These files are found in the directory /ecs/formal/CSS/DOF/src/SUBSCRIPTION/sybase

Script File	Description
make_tables.csh	Installs/populates Subscription Server database

8.2 De-Installation Scripts

Any scripts used to support de-installation of the SUBSRV database are described herein.

TBS

8.3 Backup/Recovery Scripts

Any scripts used to facilitate backup or recovery of the SUBSRV database are described herein.

TBS

8.4 Miscellaneous Scripts

Miscellaneous scripts applicable to the SUBSRV database are described herein.

TBS

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Abbreviations and Acronyms

ACL	Access Control List
ACMHW	Access and Control Management HWCI
ADC	affiliated data center
ADSHW	Advertising Server HWCI
ADSRV	Advertising Service CSCI
AI&T	algorithm integration and test
AITHW	Algorithm Integration and Test HWCI
AITTL	Algorithm Integration and Test CSCI
AM-1	EOS AM Project spacecraft 1, morning spacecraft series -- ASTER, CERES, MISR, MODIS and MOPITT instruments
ANSI	American National Standards Institute
API	application program (or programming) interface
APID	application's process ID
AQAHW	Algorithm QA HWCI
ASCII	American Standard Code for Information Exchange
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer (formerly ITIR)
AVHRR	Advanced Very High-Resolution Radiometer
BER	bit error rate
BUFR	binary universal format for representation of data
CASE	Computer Aided Software Engineering
CCSDS	Consultative Committee for Space Data Systems
CD	contractual delivery 214-001
CD-ROM	compact disk -- read only memory
CDR	Critical Design Review
CDRL	contract data requirements list
CERES	Clouds and Earth's Radiant Energy System

CI	configuration item
COTS	commercial off-the-shelf (hardware or software)
CPU	central processing unit
CSCI	computer software configuration item
CSDT	Computer Science Data Type
CSMS	Communications and Systems Management Segment (ECS)
CSS	Communications Subsystem
DAAC	Distributed Active Archive Center
DAN	data availability notice
DAO	Data Assimilation Office
DAR	data acquisition request
DAS	data availability schedule
DBMS	Database Management System
DDICT	Data Dictionary CSCI
DDIST	Data Distribution Services CSCI
DDSRV	Document Data Server CSCI
DESKT	Desktop CSCI
DID	data item description
DIM	distributed information manager (SDPS)
DIMGR	Distributed Information Manager CSCI
DIPHW	Distribution and Ingest Peripheral Management HWCI
DMGHW	Data Management HWCI
DMS	Data Management Subsystem
DMWG	Data Management Working Group
DP	Data Provider
DPR	data processing request
DPREP	Science Data Preprocessing CSCI
DPS	Data Processing Subsystem
DRPHW	Data Repository HWCI

DSS	Data Server Subsystem
ECS	EOSDIS Core System
EDC	EROS Data Center
EDHS	ECS Data Handling System
EDOS	EOS Data and Operations System
EOS	Earth Observing System
EOS-AM	EOS Morning Crossing (Descending) Mission -- see AM-1
EOSDIS	Earth Observing System Data and Information System
EROS	Earth Resources Observation System
ESDIS	Earth Science Data and Information System (GSFC)
ESDT	Earth science data types
ESN	EOSDIS Science Network (ECS)
FDDI	fiber distributed data interface
FDF	flight dynamics facility
FDFEPHEM	FDF-generated definitive orbit data
FGDC	Federal Geographic Data Commuittee
FK	Foreign Key
FOO	Flight of Opportunity
FOS	Flight Operations Segment (ECS)
GB	gigabyte (10^9)
GNU	(recursive acronym: “GNU’s Not Unix”); a project supported by the Free Software Foundation dedicated to the delivery of free software
GPCP	Global Precipitation Climatology Project
GPCP	Global Precipitation Climatology Project
GPI	GOES Precipitation Index
GRIB	GRid In Binary
GSFC	Goddard Space Flight Center
GTWAY	Version 0 Interoperability Gateway CSCI
GUI	graphic user interface

GV	ground validation
HDF	hierarchical data format
HDF-EOS	an EOS proposed standard for a specialized HDF data format
HIPPI	high performance parallel interface
HMI	human machine interface
HTML	HyperText Markup Language
HTTP	Hypertext Transport Protocol
HWCI	hardware configuration item
I&T	integration and test
I/F	interface
I/O	input/output
ICD	interface control document
ICLHW	Ingest Client HWCI
ID	identification
IDE	Interactive Development Environments
IDG	Infrastructure Development Group
IDR	Incremental Design Review
IERS	International Earth Rotation Service
IMS	Information Management System (obsolete ECS element name)
INGST	Ingest Services CSCI
IOS	Interoperability Subsystem
IP	international partners
IR-1	Interim Release 1
IRD	interface requirements document
ISO	International Standards Organization
ISS	Internetworking Subsystem
IV&V	independent verification and validation
JPL	Jet Propulsion Laboratory
L0-L4	Level 0 (zero) through Level 4

LaRC	Langley Research Center (DAAC)
LIM	local information manager (SDPS)
LIMGR	Local Information Manager CSCI
LIS	Lightning Imaging Sensor
LSM	local system management (ECS)
MB	megabyte (10^6)
MDT	mean downtime
MDT	mean downtime
MFLOPS	mega (millions of) floating-point operations (10^6) per second
MISR	Multi-Angle Imaging SpectroRadiometer
MODIS	Moderate-Resolution Imaging Spectrometer
MOPITT	Measurements of Pollution in the Troposphere
MSFC	Marshall Space Flight Center
MSS	Management Support Subsystem
MTBF	mean time between failure
MTPE	Mission to Planet Earth
MTTR	mean time to restore
N/A	not applicable
NAS	National Academy of Science
NASA	National Aeronautics and Space Administration
NESDIS	National Environmental Satellite Data and Information Service
NMC	National Meteorological Center (NOAA)
NOAA	National Oceanic and Atmospheric Administration
NSIDC	National Snow and Ice Data Center (DAAC)
O/A	orbit/altitude
ODC	other data center
OSI	Open System Interconnect
PDPS	Planning and Data Processing Subsystem
PDR	Preliminary Design Review

PDS	production data set
PGE	Product Generation Executive
PGS	Product Generation System (obsolete ECS element name) (ASTER)
PK	Primary Key
PLANG	Production Planning CSCI
PLNHW	Planning HWCI
PLS	Planning Subsystem
POSIX	Portable Operating System Interface for Computer Environments
PR	Precipitation Radar (TRMM)
PRONG	Processing CSCI
QA	quality assurance
RMA	reliability, maintainability, availability
RTF	rich text format
SAA	satellite active archive
SAGE	Stratospheric Aerosol and Gas Experiment
SCF	Science Computing Facility
SDP	Science Data Processing
SDPF	Sensor Data Processing Facility (GSFC)
SDPS	Science Data Processing Segment (ECS)
SDPTK	SDP Toolkit CSCI
SDSRV	Science Data Server CSCI
SeaWIFS II	Sea-Viewing Wide Field-of-View Sensor II
SFDU	Standard Format Data Unit
SMC	System Management Center (ECS)
SPRHW	Science Processing HWCI
SRS	software requirements specification
SSM/I	Special Sensor for Microwave/Imaging (DMSP)
SST	sea surface temperature
STMGMT	Storage Management

STMGT	Storage Management Software CSCI
SUBSRV	Subscription Server
TMI	TRMM Microwave Image
TOMS	Total Ozone Mapping Spectrometer
TONS	TDRS On-board Navigational System
TRMM	Tropical Rainfall Measuring Mission (joint US-Japan)
TSDIS	TRMM Science Data and Information System
USNO	US Naval Observatory
UT	universal time
UTC	universal time code
V0	Version 0
VIRS	Visible Infrared Scanner (TRMM)
WAIS	Wide Area Information Server
WKBCH	Workbench CSCI
WKSHW	Working Storage HWCI
WWW	World-Wide Web

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